SUCCESSFUL INFORMATION SHARING IN SCM: THE SUPPLIERS PERSPECTIVE

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One of the basic tenants of supply chain management is that improved customer service and lowered costs are derived from a close relationship between supply chain partners.[1,2] Arms length and adversarial relationships have been found to be less productive than long term partnerships.[3] A key element of supply chain partnering is the sharing of various types of information between partners, including real-time communication, planning and operational data, and even financial information. Information sharing is seen as one of the key success factors in the functioning of strategic alliances and enables supply chains to be agile in responding to competitive challenges.[4,5] As companies evolve in their supply chain practices and increase the trust and commitment between partners, they typically increase the degree and type of information shared.[6]

Arms length relationships that had dominated business practices in the past created numerous undo negative effects for suppliers.[7] This included short lead times in responding to demand and a general view of the customer as an adversary. Information sharing between customers and suppliers, the foundation of collaboration between supply chain partners, has been expected to alleviate many of these negative effects.[8] The reason is that information allows all entities in the chain the ability to respond to the same information as those closest to the customer. Also, an increase in the degree of shared information is expected to enhance the cohesiveness between partners by enabling the partners to work in unison toward a shared vision.

However, some evidence has suggested that the reality of implementation of SCM has created added pressures for suppliers, such as increased pressure to respond to customer demands and greater dependence.[9] Although considerable research has been conducted on the nature of interorganizational relationships, studies have called for more empirical research to help identify

practical knowledge in managing successful alliances. [10, 11] The purpose of this study is to contribute to this body of knowledge.

Our research identifies negative effects of supply chain collaboration experienced by suppliers, the types of information customers share with suppliers, and the relationship between the negative effects and degree of information shared. We hypothesize that information sharing is inversely related to the negative effects experienced by suppliers, due to lowered uncertainty and greater forward visibility. Finally, we identify key factors that define a world-class customer from the suppliers point of view.

BACKGROUND

Increased focus on SCM over the past two decades has helped firms take a greater relational approach with external entities through information sharing and cooperative planning.[12] There has been increased understanding that such cooperation helps position the entire chain as a source of competitive advantage.[13] This competitive advantage can come in the form of enhanced responsiveness, cost reductions, as well as improved performance and profitability. [14, 15] Consequently there has been a growing body of literature addressing issues relative to partnerships with an inter-organizational focus. [16, 17, 18]

Although the benefits of partnerships have been well documented there has been little research on the disadvantages and pitfalls that can befall supply chain partners. There is some evidence that strategic alliances can be driven by issues of power and control rather than by having a mutual win-win relationship.[19] For example, a study by Lieb and Randall addresses potential disadvantages for shippers in the use of third-party providers.[20] These disadvantages are identified to include loss of control, increased uncertainties, and cost concerns. Malone and Benton address power imbalance in the auto industry and note that benefits achieved are

sometimes overshadowed by supplier resentment and lack of synergy.[21,22] Studies by Handfield[23] and Provan and Skinner [24] investigate the relationship between dependence and control in the buyer-supplier relationship and found greater control to be associated with greater opportunism.

Ackerman identified reasons why logistics partnerships fail.[25] These include lack of mutual understanding between parties, over-promising, deliberate sabotage, and unprofitability for the supplier. Similarly Ellram identified factors such as poor communication, lack of top management support, lack of trust, and lack of strategic direction for the partnership that lead to partnership failure.[26] A number of studies offer prescriptions for successful partnerships.[27, 28] One important success factor identified is *information sharing*.

Information sharing describes the extent to which one party in the chain communicates critical and proprietary information to another party in the chain. [29] In order for partners to achieve systems coordination certain basic operations information must be shared in real time. This includes information such as production schedules, delivery schedules, and order status. However, a true supply chain alliance goes well beyond coordinated processes and includes shared goals and a shared vision.[30, 31] The development of shared goals, which requires mutual trust and commitment, goes hand in hand with complete transparency of information. As companies evolve in their implementation of SCM the degree of information transparency and mutual commitment should increase and the negative effects typically associated with arm length relationships should be expected to decrease.

Although some studies have looked at the supply chain relationship from the buyer's perspective little has been done from the perspective of the supplier.[32] Our study focuses on the buyer-supplier dyad in the supply chain from the supplier's point of view. The specific analysis focuses on the buyer-supplier relationship between first tier suppliers and their large

manufacturing customers. We begin our study by identifying the most significant negative effects experienced by these suppliers and the types of information provided by the customer. Using correlation analysis we isolate significant relationships between the identified negative effects and type of information shared. Finally, we identify key factors that suppliers identify as defining a world-class customer.

CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESIS

Our study is based on the proposition that negative effects of supply chain collaboration diminish as the amount of information provided by the customer increases. This is stated the following hypothesis:

H1: The negative effects of SCM experienced by the supplier are inversely related to the amount of information shared by the customer.

These assumptions are supported by previous research. [33, 34, 35] We present this conceptual framework in Figure 1. The two dimensions of this framework, negative effects of SCM and types of information shared, are discussed next.

(Figure 1 here)

Negative Effects of SCM

Based on the literature we develop three categories of negative effects that can be experienced by suppliers while involved in a supply chain partnership: dependence pressure, performance pressure, and evaluation pressure.[36, 37, 38] Elements that comprise each of these categories are shown in Table 1.

(Table 1 here)

Dependence pressure can be viewed as the negative consequence of long term partnering. Each member of the supply chain is dependent upon the performance of the other. Suppliers, who are often smaller and less powerful than their customers can be more vulnerable of the two in the relationship. This is particularly true of small suppliers whose capacity may be entirely absorbed by one customer. [39] These firms may feel *vulnerable to changing customer demands* and *overly dependent on customer(s) business*. Further, there is some evidence that in certain industries *customers may expect supplier to carry greatest risk*.[40] Finally, as information sharing increases to the point of transparency the supplier may find *the customer overly involved in supplier business,* such as policy setting and cost containment strategies. Hence, these pressures define the negative effects our first category.

As information flows downstream expectations of performance may increase as well, with the customer expecting increasingly greater responsiveness from the supplier. The customer may expect *too much support from the supplier*. This may be unreasonable responsiveness, expectation to perform an increasing number of tasks, and hold riskiest forms of inventory. A frequently observed occurrence is for the supplier to *carry excess inventory for the customer*.[41] The customer may claim a just-in-time (JIT) process, when in fact the supplier may be warehousing most of the inventory. Lastly, in an environment of cost containment, suppliers are under increasing pressure to cut costs. This pressure may become excessive, creating the need to *pass these costs on to their own suppliers.*

The area of performance measurement in supply chains has received a great deal of attention. As supply chain management focuses on performance, there may be *undue pressure to perform to standards.* Also, in a results oriented culture, suppliers may find that they are being evaluated against *standards that are unfairly imposed by the customer*, or that they are *evaluated*

unfairly. For example, this latter occurrence may be the result of the need to pass blame for poor performance.

We note that these negative effects are *not* in the true spirit of SCM. SCM underscores that chain partners must genuinely work together with a common vision to effectively compete in the marketplace.[42] True SCM partners understand that they must equally share in the risks and rewards. To compete effectively cost cutting effort must be made across the entire chain as passing costs on to partners inevitably affects everyone in the chain.

Types of Information Shared

The type of information shared between partners increases as the supply chain relationship evolves. We differentiate four types of information shared: *performance information*, *operations information*, *planning information*, and *financial information*. This information is presented in Table 2 and shown in increasing order of transparency and degree of sharing.

(Table 2 here)

The most basic type of information shared is that of the customer sharing information on performance measures against which the supplier is evaluated and how the supplier fares against these measures. The sharing of this type of information is so fundamental that one could argue that it does not constitute SCM. The information shared in SCM should help partners synchronize schedules and eventually move toward coordinated execution and planning.

The second level of sharing is that of *operations type information*, such as production schedules, return status, and order tracking. Sharing of operations type information is fundamental for coordination of processes. Next is sharing of *planning information*. This type of information expands the relationship beyond mere operations an schedules, and allows for a shared view of the future. This includes forecasts, sales information, and future production plans.

Lastly, the sharing of financial information, including cost and profit data, sets the foundation for sharing of financial burdens and benefits and is the foundation of a long-term commitment.

RESEARCH METHODOLOGY

Data Collection

To test our research hypothesis a survey methodology was used to collect data. The type of information needed required the respondent to have an overall understanding of the buyer-supplier relationship they are currently engaged in. Consequently, the instrument was sent to the President or CEO of companies identified as first tier suppliers to large OEM manufacturing firms. The survey instrument was initially field tested by members of the Council of Logistics Management (CLM) and the National Organization of Purchasing Management (NAPM). Following modification, the instrument was mailed to the heads of 2,000 U.S. industrial first-tier suppliers.

Of the responses received, about one fourth were returned unanswered for change of address, company policy, and other reasons. From the remaining 1,500 potential company participants, 108 useable questionnaires were returned. Although the response rate was only 7.2 percent, given the survey approach, the total response of 102 supplier firms is relatively large for studies of this nature. The typical respondent to the survey held the title of Owner, President, CEO, Vice President, or Plant Manager.

The Survey Instrument

The survey contained four categories of questions: general company information; the strategic planning information; information technology (IT) issues; and supply chain management

(SCM) issues. All questions were based on a five-point Likert type scale. The survey data were compiled and analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows.

Testing for Non-Response Bias

To ensure adequacy of the response sample, an issue with any survey methodology, our study tested for non-response bias. Non-response bias was tested by progressively comparing the demographics of the first and second wave of respondents.[43] The reasoning behind this practice is that the last wave of respondents should be most like that of non-respondents, compared to the first wave. Dimensions tested were average sales, market share growth, employment, and industry mix. No significant differences were found between the two samples.

Sample Description

The majority of the companies responding to the survey were manufacturing firms (86.5 percent). The remaining firms were classified as warehouse and distribution, transportation, and service firms. Firms ranged in size from annual sales of $2 million to $3 billion, with mean and median sales of $99 million and $17.5 million, respectively.

In order to ascertain the general degree of importance respondents place on SCM the respondents were asked to indicate the importance SCM plays in the strategic planning of their firms. Respondents were asked to indicate the importance SCM plays in the strategic planning process of their firms. The vast majority – eighty nine percent – indicated that SCM was either moderately significant or highly significant. As our survey questions related to specific SCM issues we wanted to ensure that the respondents in our sample placed SCM at the forefront of their organizations.

RESULTS

Negative Effects of Supply Chain Collaboration

The first findings from our study relate to the identification of negative effects experienced most frequently by the largest number of respondents. The suppliers surveyed were asked to identify whether they experienced a particular negative effect and how often. A five-point Likert type scale was used to ask this question with options for responses ranging from *never* to *always*, with the mid-point indicated as *occasionally*. These findings are shown in Table 3 in descending order based on responses to the 'always' column to highlight most important negative effects. Although these findings are shown in descending order we do not attempt to rank these. We note that the five-point scale has been collapsed to three distinct responses for purposes of clarity. Significant differences at the 0.05 level were computed between categories of responses for each negative effect using a paired t-test and are indicated in the table.

(Table 3 here)

Our findings show the majority of respondents to indicate *vulnerability to customer(s) changing demands* (X1) to be the negative effect always experienced by the greatest percentage of respondents. We also note that the number of respondents indicating this negative effect to always be a problem is significantly greater than those experiencing it occasionally or rarely/never. This negative effect falls in the category of dependence pressures and is followed by two other effects from the same category, *customer expects supplier to carry greater risk* (X3) and *overly dependent on customer(s) business*. The top three most significant negative effects are found to fall in the category of dependence pressures

Following these are three negative effects that fall in the category of performance pressures. However the number of respondents reporting to always experience these negative

effects is not significant compared to the number of respondents experiencing it occasionally or rarely/never. Next are three negative effects from the evaluation category, which are never or rarely experienced by the majority of suppliers. The very last negative effect, customer overly involved in suppliers business (X4) is never or rarely experienced by the vast majority of respondents.

Observing the findings in descending order we note that the three highest negative effects fall in the category of dependence pressures, followed by performance pressures, and lastly by evaluation pressures, with the exception of variable X4. The dependence pressures are always experienced by a significantly greater number of respondents. Performance pressures are roughly evenly divided between categories, indicating that some suppliers find this a frequent problem whereas others do not. The variables in the last category, evaluation pressures, are not a problem for a significant group of respondents.

Type and Degree of Information Sharing

The next set of findings related to the degree and type of information shared by the customer with the supplier. To assess the overall degree of information sharing we asked respondents to indicate the degree to which their primary customer(s) shared information with them. The scale used, ranging from little/no sharing to collaborative planning and decision making, evaluated a progressively increasing degree of sharing. These findings, shown in Table 4, indicate that the significant majority of respondents engage only in data sharing without any coordination. Only a small percentage (12.5%) engage in collaborative planning and decision making. This finding shows that despite lengthy discussions in the supply chain literature on the merits of using information as the basis of collaboration, most companies are still in the beginning stages of information sharing.

(Table 4 here)

Findings relative to the specific types of information customers share with their suppliers are shown in Table 5. As with previous tables, the five-point Likert type scale was collapsed to three categories for purposes of clarity. Responses are ranked in descending order based on significant to open book sharing, shown in the third column. Significant differences at the 0.05 level between the significant/open book sharing column and the other categories are indicated in the table.

(Table 5 here)

An overview of the findings shows that the information shared the most relates to performance measures (A1). The least shared is financial information (D1) with eighty-eight percent of the respondents indicating little or no sharing of this type of information. Between these extreme points are a mix of production and planning information, with planning information appearing to be shared more of the two. We note that over fifty percent of the firms responding have little to no sharing of production plans (C3) and sales information (C2). Sharing of financial information (D1) appears quite rare. Based on these findings we observe that the practice of information sharing greatly lags theoretical discussion.

Next we look at the relationship between the identified negative effects and type of information sharing.

The Relationships Between the Negative Effects and Information Sharing

Extensive correlation analysis was performed to identify relationships between negative effects and the type of information shared. In order to support our hypothesis, that an inverse relationship exists between the identified negative effects and amount of information shared, a pattern of negative correlations needed to be identified. Although such a clean pattern is not

observed, clusters of correlations offers partial support of our hypothesis and reveal interesting relationships between certain variables. Three clusters of significant relationships are found and shown in Figure 2 with corresponding correlation coefficients. Single and double asterisks are used to indicate significance at the 0.05 and 0.01 level respectively.

(Figure 2 here)

A significant negative relationship is found to exist between negative effect Y1 (*customer expects too much support from supplier*) and three information variables: C1 (*forecast information*), C2 (*sales information*), and B1 (*production schedules*). It appears that the suppliers' perception that their customers require too much support is inversely related to the sharing of fundamental types of information that would provide the supplier with forward visibility. Based on this finding we can assume that more of this type of information would contribute to the alleviation of these pressures and provides only partial support for our hypothesis.

Our hypothesis assumes a somewhat simplistic and linear relationship between negative effects and information. Further findings reveal a more complex dynamic between these variables. The second significant cluster observed centers around negative effect Y3 (*excessive pressure to pass costs on to suppliers*) which is found to be positively correlated with the sharing of a variety of operations type information such as *return status* (B2), *order tracking* (B3) and *production plans* (C3). This finding implies that the greater the amount of this type of information provided the larger the perception of excessive pressure to pass costs to suppliers. One explanation for this may be that by providing this information the customer may expect the supplier to directly address the cost issues surrounding the problem and be responsive to the problem at suppliers cost. It is quite plausible that as customers pass more information to

suppliers they expect the suppliers to react to this information at their own expense. This is consistent with studies to date. [44]

The last significant cluster observed is the positive relationship between the sharing of financial information and three negative effects. These negative effects are that the *customer expects supplier to carry greatest risk* (X3), *customer is overly involved in suppliers business* (X4), and there is *excessive pressure to pass costs to suppliers* (Y3). Based on these findings it appears that greater sharing of financial information may be perceived as intrusive and controlling. This may be one of the reasons why this type of information is still shared by a small fraction of respondents.

Characteristics of a World-Class Customer

Our findings thus far document that there are a number of negative effects experienced by suppliers, some of which may be addressed through greater information sharing. Although there has been much discussion relative to the characteristics of world-class suppliers, not much has been discussed relative to the characteristics of a world-class customer from the suppliers point of view. We asked survey respondents to evaluate a number of factors that can be used to describe a world class customer. As with other questions, a Likert type scale was used with responses that ranged from *not significant* to *highly significant*. These findings are shown in Table 6.

(Table 6 here)

The findings in Table 6 are presented in descending order based on the high significance column. Significant differences at the 0.05 level based on a paired t-test are identified. We note that *open communication* is the factor considered of high significance by the vast majority of respondents. This is in line with our previous findings, namely that greater information is important, however only in the context of openness and honesty.

The next four factors, also found to be significant, describe a relationship that is long term in nature with the customer making a vested interest in the supplier. This includes variables that describe involving the supplier in the longer term planning of the firm (*supplier involved in product development*) and the customer investing resources in the supplier (*customer strives to develop supplier*).

The last set of factors listed in the table, which are found *not* to be significant, describe cultural and administrative alignment. These findings point out a number of interesting issues. First, suppliers consider open communication the most important factor, which constitutes the theoretical foundation of SCM. Cultural issues and alignment are considered least important. This may be due to the fact that cultural alignment may not matter if there is no open communication.

DISCUSSION

The purpose of this research was to evaluate the relationship between negative effects experienced by suppliers and the types of information shared by their customers. We hypothesized that an inverse relationship may be present, namely that greater information provided may temper certain negative effects by alleviating supplier uncertainty. Our findings show that the most significant negative effects related to the issue of supplier dependence on customers. Issues regarding performance and evaluation pressures were found to be less significant. Although the vast majority of our sample respondents (88.7%) identify SCM as playing a significant role in their organizations, the vast majority only reported information sharing without collaboration. The most frequent information shared was that relating to performance measures, followed by operations information. Planning type information was

shared by a significantly smaller percentage of respondents and financial information was shared by a rare minority.

Findings relative to the relationship between negative effects and information shared reveal interesting findings. Essentially three cases are uncovered. In the first case a *lack of information* was found to be associated with a perception on the suppliers part that the customer expects too much support from supplier. In the second case *presence of information* was associated with the perception that the customer is passing excessive burden on to the supplier in the form of costs. In the last case, financial information was perceived as intrusive and controlling.

These findings may appear inconsistent and reveal the complexity of the buyer-supplier relationship. They show that mere information sharing is not enough for true supply chain collaboration and that more information can in fact be associated with a number of negative effects. This may be the case when information is merely passed on without a sharing of problem solving procedures. The literature underscores that the foundation of true supply chain collaboration is open and honest communication between partners. Ironically, this is precisely the factor considered most important by suppliers in our survey in defining a world-class customer.

MANAGERIAL AND RESEARCH IMPLICATIONS

Our findings reveal that the practice of SCM appears to be in its infancy relative to its theoretical potential and the foundation of long-term partnering established by the literature. It appears that information is shared between partners but that there is significant lack of joint planning and collaboration. A number of significant managerial and research implications emerge from our findings.

Managerial Implications

Information sharing is necessary to synchronize operations, reduce costs, and improve responsiveness. However, mere information sharing is not enough to achieve benefits of supply chain collaboration and may only create additional problems. Joint setting of procedures, expectations, and responsibilities is necessary in order for both parties to utilize that information to greatest advantage. It appears that resentment may be created when information is simply passed on with the expectation that the supplier react to it at their own expense. Further, great care should be taken in the sharing of proprietary information, such as financial data, so that all parties feel they have equal control in the decision making process. It appears that the greatest contribution a customer can make toward the creation of a solid supply chain partnership is to engage in open communication with their suppliers.

Research Implications

The buyer-supplier relationship creates a complex dynamic and a better understanding of the realities of these relationships is needed. Given the large gap between theoretical frameworks and the realities of practice, greater empirical research is needed to support theoretical models that help define factors of success. Finally, future research should help provide specific guidelines of how the buyer-supplier relationship can structure a balance between information sharing and responsibility to the satisfaction of both parties.

NOTES

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FIGURE 1

CONCEPTUAL MODEL

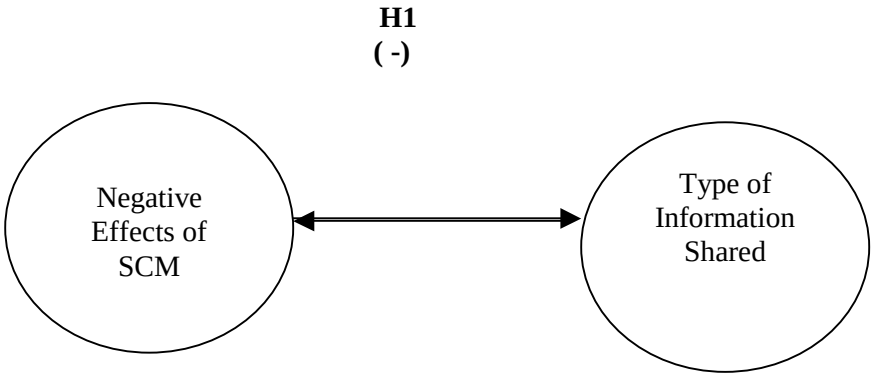


TABLE 1

NEGATIVE EFFECTS OF SUPPLY CHAIN MANAGEMENT

DEPENDENCE	
X1	Vulnerable to customer changing demands
X2	Overly dependent on customer(s) business
X3	Customer expects supplier to carry greatest risk
X4	Customer overly involved in supplier(s) business
PERFORMANCE	
Y1	Customer expects too much support from supplier
Y2	Carrying excess inventory for customer
Y3	Excessive pressure to pass costs on to your supplier
EVALUATION	
Z1	Undo pressure to perform to standards
Z2	Evaluated unfairly
Z3	Standards unfairly imposed by customer

TABLE 2

TYPES OF INFORMATION SHARED

PERFORMANCE INFORMATION	
A1	Performance Measures
OPERATIONS INFORMATION	
B1	Production Schedules
B2	Order Tracking
B3	Return Status
PLANNING INFORMATION	
C1	Forecasting
C2	Sales Information
C3	Production Plans
FINANCIAL INFORMATION	
D1	Financial data

TABLE 3

NEGATIVE EFFECTS OF SCM AS EXPERIENCED BY SUPPLIERS
(percentage respondents)

	Never or Rarely	Occasionally	Always
Vulnerable to customer changing demands (x1)	15	29	56*
Customer expects supplier to carry greater risk (x3)	18	30	48*
Overly dependent on customer(s) business (x2)	28	29	43*
Excessive pressure to pass cost on to suppliers (y3)	40	20	40
Carrying excess inventory for customer (y2)	27	43	30
Customer expects too much support from supplier (y1)	42	29	29
Undo pressure to perform to standards (z1)	34	38	28
Standards unfairly imposed by customer (z3)	43	38	19*
Evaluated unfairly (z2)	43	42	15*
Customer overly involved in suppliers business (x4)	66	26	8*

Note: variables are shown in descending order based on responses to the 'Always' column; asterisks denote significant differences between responses to 'always' and 'rarely/never' and 'occasionally' at the 0.05 level developed using a paired t-tests.

TABLE 4

DEGREE TO WHICH PRIMARY CUSTOMER(S) SHARE DATA WITH SUPPLIER

Degree of Sharing	Response (%)
Little to No Sharing	18.3
Data Sharing Without Coordination	42.3 *
Synchronous Execution	26.9
Collaborative Planning and Decision Making	12.5

* indicates significant differences between categories at the 0.01 level.

TABLE 5

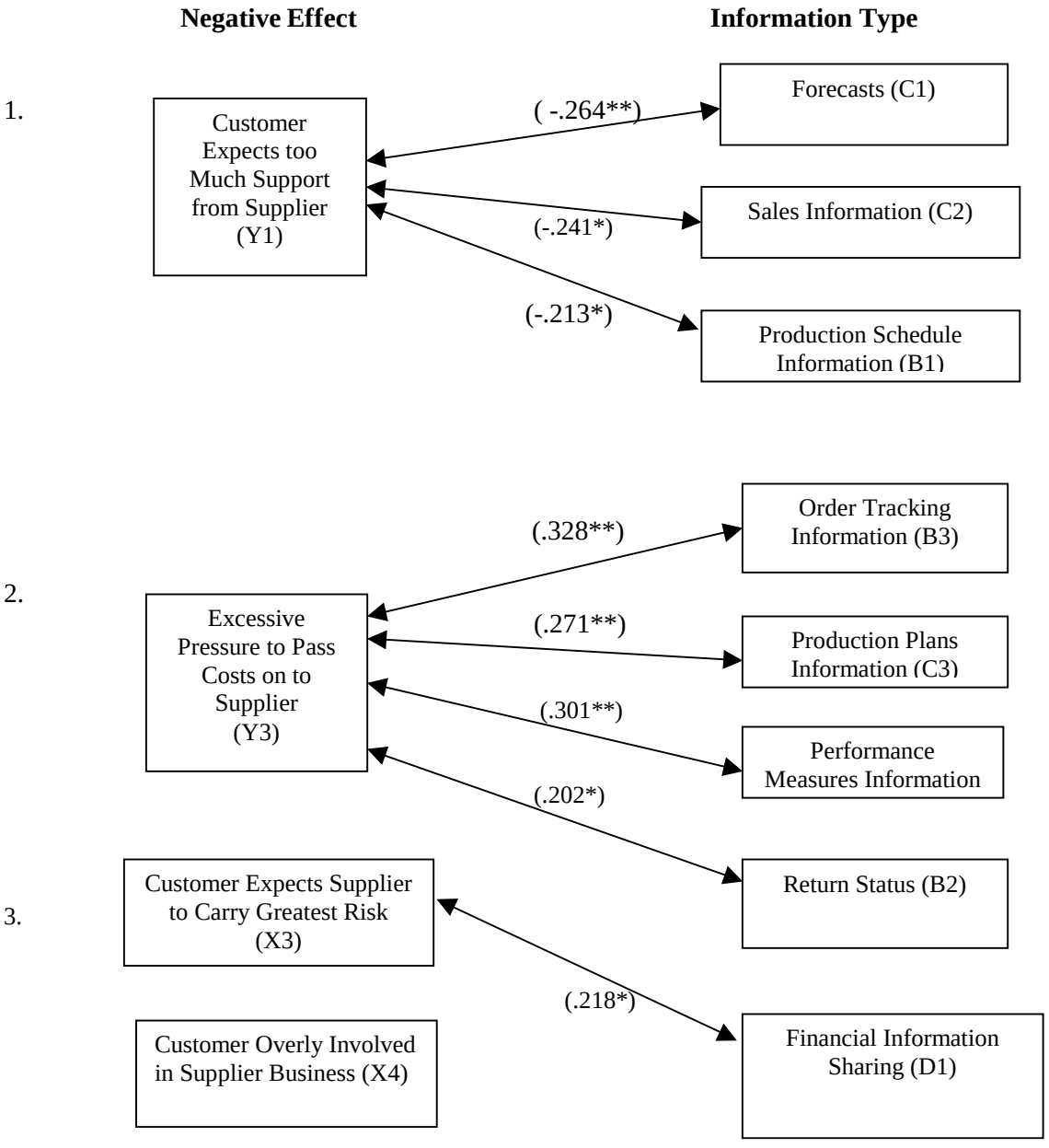
TYPES OF INFORMATION CUSTOMER(S) SHARE WITH SUPPLIERS

	Little to some Sharing	Moderate Sharing	Significant to open book sharing
Performance measures (A1)	32	29	39
Production schedules (B1)	43 *	26	31
Return status (B2)	43 *	29	28
Forecasts (C1)	47 *	26	27
Order tracking (B3)	50 *	26	24
Production plans (C3)	54 *	26	20
Sales information (C2)	67 *	20	13
Financial information (D1)	88 *	8	4

Note: variables are shown in descending order based on responses to the 'significant to open book sharing' column; asterisks denote significant differences between responses to 'little to some sharing' and the remaining categories at the 0.05 level developed using a paired t-tests.

FIGURE 2

SIGNIFICANT RELATIONSHIPS BETWEEN NEGATIVE EFFECTS AND INFORMATION TYPE



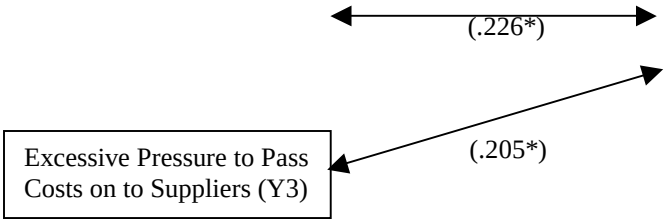


TABLE 6

SUPPLIERS' RATING OF FACTORS THAT DESCRIBE WORLD-CLASS CUSTOMERS

	Minor to No Significance	Average Significance	Some to High Significance
Open communication	3	0	97 *
Involves supplier in product development	13	12	75 *
Joint setting of performance standards	5	26	69 *
Customer strives to develop supplier	19	22	59 *
Real time information sharing	22	24	54 *
Unifying culture	26	32	42
Compatible organizational culture	23	40	37
Aligned organizational procedures	25	43	32

Note: variables are shown in descending order based on responses to the 'high significance' column; asterisks denote significant differences between responses to 'high significance' and the remaining two categories at the 0.05 level developed using a paired t-tests.